

Notas / Notes

Forums and social media help to discover exotic species in Europe and monitor their spread: the case of *Exaireta spinigera* (Wiedemann, 1830) (Diptera, Stratiomyidae) in the Italian peninsula and Sicily

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ABSTRACT

The soldier fly *Exaireta spinigera* (Wiedemann, 1830) (Diptera, Stratiomyidae) is native to Australia and has been introduced in Hawaii, North America and is quickly spreading across Europe. We comment the existing knowledge concerning its presence in Italy and publish the first records from Sicily. The existing knowledge regarding arrival and distribution of this species in Italy is exclusively based on data provided by citizens through biodiversity-focused internet forums and Facebook groups, which have hence proved to be a useful aid to the difficult detection of invasive species.

Key words: Diptera; Stratiomyidae; citizen science; Facebook; invasive species; biodiversity data.

RESUMEN

Los foros y las redes sociales ayudan a descubrir especies exóticas en Europa y monitorear su propagación: el caso de *Exaireta spinigera* (Wiedemann, 1830) (Diptera, Stratiomyidae) en la península italiana y Sicilia

La mosca soldado *Exaireta spinigera* (Wiedemann, 1830) (Diptera, Stratiomyidae) es originaria de Australia y se introdujo en Hawái, América del Norte y se está extendiendo rápidamente por Europa. Comentamos el conocimiento sobre su presencia en Italia y publicamos los primeros registros de Sicilia. El conocimiento existente sobre la llegada y distribución de esta especie en Italia se fundamenta exclusivamente en datos proporcionados por ciudadanos a través de foros de internet y grupos de Facebook sobre biodiversidad, que así han demostrado ser una ayuda útil para la difícil detección de especies invasoras.

Palabras clave: Diptera; Stratiomyidae; ciencia ciudadana; especies introducidas; especies invasoras; biodiversidad.

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The garden soldier fly *Exaireta spinigera* (Wiedemann, 1830) is an Australian member of the family Stratiomyidae Latreille, 1802. It is the second exotic species of this family to arrive in Italy after *Hermetia illucens* (Linnaeus, 1758),

which was first recorded in 1956 (Venturi, 1956). Outside its native range, *E. spinigera* is known in Hawaii (Hardy, 1960), North America (Swann *et al.*, 2006), France (Lapeyre & Dauphin, 2008) and Italy (Cocquempot & Martinez, 2017). Its status as

Table 1.— Facebook groups and internet forums consulted during the research (only groups with > 1,000 users are listed).

Tabla 1.— Grupos Facebook y foros de internet italianos que fueron consultados durante el transcurso de esta investigación (solo grupos con > 1.000 usuarios estan listados).

Name	Type	Link	N° of users (June 2018)	Main topic	Observations of <i>E. spinigera</i>
Insetti e altri artropodi- un fantastico mondo da scoprire	Facebook group (public)	https://www.facebook.com/ groups/96614526499/	22,170	Italian insects and arthropods	1 individual, no locality or date, uploaded in 2016 1 individual, Gioiosa Marea (ME), Sicily, Italy, May 2017 1 individual, Catania (CT), Sicily, Italy, 2 Jul 2018
Fauna Siciliana	Facebook group (closed)	https://www.facebook.com/ groups/faunasiciliana/	17,420	Sicilian terrestrial and freshwater fauna	1 individual, Giarre (ME), Sicily, Italy, April 2018 1 individual, Gioiosa Marea (ME), Sicily, Italy, July 2018
Forum Natura Mediterraneo – Forum Naturalistico	Internet forum	https://www.naturamediterraneo. com/forum/	15,370	Italian biodiversity	1 individual, Acquapendente (VT), Italy, 2015. 1 individual, Acquapendente (VT), Italy, 2016 (reported in Cocquempot & Martinez 2017).
Birdwatching & Wildlife	Facebook group (closed)	https://www.facebook.com/ groups/birdwatchingwild/	13,300	Photography of Italian fauna (mostly birds)	None
Riconoscimento insetti	Facebook group (public)	https://www.facebook.com/ groups/132214586801002/	10,120	Identification of the Italian entomofauna	1 individual, no locality or date, uploaded in 2017 1 individual, Acireale (CT), Sicily, Italy, 16 Sept 2018
Fotografare insetti e fiori	Facebook group (public)	https://www.facebook.com/ groups/bennyph/	9,425	Photography of flowers and Italian entomofauna	None (a single case of misidentification of <i>Sargus</i> sp.)
IDENTIFICAZIONE ANFIBI E RETTILI	Facebook group (public)	https://www.facebook.com/ groups/283231695476830/	8,630	Identification of Italian herpetofauna	None
ENTOMOLOGIA	Facebook group (public)	https://www.facebook.com/ groups/157858384240686/	6,640	Italian entomofauna	None
Forum Entomologi Italiani	Internet forum	http://www.entomologiitaliani. net/public/forum/phpBB3/	6,190	Italian entomofauna	None
Aracnofili, allevatori e studiosi di ragni	Facebook group (public)	https://www.facebook.com/ groups/47071723480/	5,450	Italian and exotic spiders	None
Flora e fauna della Sardegna e non solo	Facebook group (public)	https://www.facebook.com/ groups/206872009324117/	5,110	Sardinian fauna and flora	None
Aracnofilia Forum	Internet forum	https://forum.aracnofilia.org/	4,656	Captive breeding of Arachnida	None
Entoforum	Internet forum	http://www.entoforum.it/	2,140	Captive breeding of exotic insects	None
Formicarium.it	Internet forum	http://formicarium.it/forum/	1,990	Captive breeding of Italian ants	None
Libellule d'Italia	Facebook group (public)	https://www.facebook.com/ groups/967380646607804/	1,750	Italian Odonata	None

exotic species in New Zealand is currently uncertain (Derraik & Heath, 2009). Despite the broad distribution achieved, the interactions of *E. spinigera* within non-native ecosystems as well as its general biology are mostly unknown. Its traits may be generally similar to those of the relatively well-studied *H. illucens* (Cocquempot & Martinez, 2017), which is not usually regarded as a pest species or a threat to native ecosystems. However, even the impacts of *H. illucens* on native biodiversity are also mostly uninvestigated (De Groot & Veenliet, 2011).

The presence of *E. spinigera* was first recorded in Italy from the Italian peninsula by Cocquempot & Martinez (2017), who cited an observation originally appeared on the Italian internet forum 'Forum Natura Mediterraneo – Forum Naturalistico'. We attempted to find additional *E. spinigera* observations by searching in Italian Facebook groups and internet forums with a focus on terrestrial faunistic biodiversity (Table 1). As a result, nine additional records were found among Facebook groups and internet forums (Table 1), revealing the presence of this exotic species in the island of Sicily.

Containment or eradication of invasive exotic species can be virtually impossible or at least very costly if their presence is not detected early enough after their first arrival. Therefore, the development of early-warning systems in Europe is a crucial need (Genovesi, 2005). Many citizen science projects have obtained valuable results in the aim of collecting distribution data on exotic species, including in Europe (e.g., Bois *et al.*, 2011; Zenetos *et al.*, 2013; Adrianes *et al.*, 2015; Maistrello *et al.*, 2016, 2018; Mori *et al.*, 2017) and more specifically in Sicily (e.g., Faraone *et al.*, 2017; Mannino & Balistreri, 2018).

The involvement of a large number of citizens can be a precious tool in order to monitor species presence across large areas. *Exaireta spinigera* is a relatively large insect (up to about 14 mm) and it is characterized by a colorful and easily distinguishable habitus (Fig. 1). It may easily attract the attention of a potential photographer and it can be identified even with a low-quality picture due to its unmistakable aspect. Significant occurrence data on Diptera, gathered from pictures taken by non-specialists and uploaded on internet, were also gathered in the case of native and even endangered species (e.g., Marcos García & Ricarte, 2013; Álvarez Fidalgo *et al.*, 2018). The presence of *E. spinigera* in the Italian territory (peninsular Italy and now Sicily island) is solely known thanks to amateur entomologists and other citizens, who operated outside the framework of a focused citizen science project, but were active in biodiversity-themed internet forums and Facebook groups. In these forums and groups hundreds of thousands of relatively verifiable data are uploaded daily, mostly following a very simple but effective 'protocol': providing pictures of organisms along with temporal and geographic information. Such protocol is the same of platforms as iNaturalist (www.inaturalist.org). While the resulting data may be comparatively less easily available to the scientific community in the case of forums and Facebook groups, social media may attract more participants. In conclusion, a way to easily pass the data uploaded on social media and forums to large databases like GBIF (Global Biodiversity Information Facility, www.gbif.org) could be beneficial in the future. The use of social media to gather relevant data on biological and ecological issues is likely to increase in the future (e.g. Hart *et al.*, 2018).



Fig. 1.— *Exaireta spinigera* in Sidney, Australia. Photo by John Tann.

Fig. 1.— *Exaireta spinigera* en Sidney, Australia. Fotografía de John Tann.

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